**STUDENT ACTIVITY: Exploring solar power**

**Activity idea**

In this activity, students explore sunlight being converted into electricity. They are introduced to the concept of photovoltaics – making electricity from sunlight. They will become aware of some of the problems with current solar technology.

By the end of this activity, students should be able to:

* explain the term ‘photovoltaic’
* explain that light waves from the sun can be used to produce electricity for common use
* list some current uses of solar power
* explain some of the benefits and problems associated with solar technology.

[Introduction/background notes](#Introduction)

[What you need](#NEED)

[What to do](#do)

[Extension ideas](#extension)

**Introduction/background**

In photovoltaic cells, sunlight shines through a thin sandwich of two different types of silicon. The Sun’s energy causes some electrons to cross from one side of the sandwich to the other.

In this way, the solar cell ‘pumps’ electricity (the movement of electrons) through itself and around the circuit. The solar cell will keep producing electricity as long as the Sun is shining on it.

The students will see the results of this happening by investigating and playing with some solar powered devices. They will appreciate that, if the Sun is not directly shining on their device, it will not go.

They will also read and discuss the story ‘Make way for the Solar Kiwi’ about how a solar powered car designed and built by New Zealanders Vivianne and Stewart Lister performed in the 1993 World Solar Challenge race from Darwin to Adelaide.

Students will learn about and discuss some of the problems associated with the solar powered car.

Discussion should extend to recent developments in solar powered technology and any ideas the students may have to improve solar technology.

**What you need**

* Solar energy devices (purchased from electronic shops), for example, solar energy toys (cars, jumping frogs, fans) or solar energy kits to make solar devices (alarms, light bulbs, garden lights)
* ‘Make way for the Solar Kiwi – an interview with David Somerset’ (*School Journal* Part 4, Number 3, 1994)
* Copies of or online access to the article [Photovoltaic roofs](http://link.sciencelearn.org.nz/resources/1745-photovoltaic-roofs).

**What to do**

1. Divide the students into groups. Give each group a different solar device. Send them outside to investigate the devices. Let them explore them and ‘discover’ how they work. Have them swap devices with another group after a designated time.
2. Have a class discussion about the investigation:

* What happened? (Discuss movement/activity of devices – that movement only occurred in the sunlight.)
* What is the same about all the devices? (They all have solar cells, they all function when the Sun is shining on them.)
* What do you think the cell is doing? (Working with the Sun to produce electricity – to make the device go.)
* How? (Give the students an opportunity to express how they think the electricity is produced. Develop the discussion to include the idea of light being converted into electricity.)

1. Introduce the word ‘photovoltaic’. Write it up and ask students if they recognise a word within the word. Most students will respond with ‘photo’. A discussion on photos and cameras will reveal that light is involved. Write up ‘light’. Often someone will also recognise the word ‘volt’, which is then associated with electricity. Write up ‘electricity’. Help students realise photovoltaics is about making electricity using light.

1. Develop the concept of producing electricity using a semiconductor and photons. Photovoltaic panels are made up of many solar (photovoltaic) cells. The more cells you have, the more electricity you will produce.

* Where have you seen photovoltaic panels? (Students may suggest the bus stop or roofing panels, or they may be aware of solar panels on space satellites or lighthouse beacons.)

1. Read the story ‘Make way for the Solar Kiwi’.

1. Discuss the merits and problems of this solar powered car:

* How practical would this car be for everyday use?
* Why? Why not?
* In what ways could it be improved?

1. Have students research recent developments in solar powered vehicles. The students could then design and draw a plan for a solar powered car.
2. Develop a discussion around this statement: ‘Solar energy is not new – there has always been the Sun and the energy we receive from it.’ Encourage students to suggest ways people have used solar energy in history (built homes to allow the Sun to heat them, drying meat, drying clothing, heating water).
3. Ask students what is new about solar energy. Encourage them to understand that, although solar energy itself is not new, scientists are exploring new ways (and technologies) to use the Sun’s energy for our benefit (for example, photovoltaic panels).
4. Ask students where else photovoltaic panels could be used to supply electricity. Develop a discussion around using photovoltaic panels on or in a roof for supplying electricity to a household:

* How would this work?
* When do we need most of our electricity?
* What would happen at night?

1. Discuss the need to store electricity and the consequent need for batteries or connection to the national electricity grid. (In this case, the electricity produced from the roof would be fed into the grid and electricity would be returned back to the house from the grid, maintaining a constant supply.)
2. Have students draw a diagram of a house with photovoltaic roofing. Draw and describe the course of electricity through the house (showing panels, wiring and batteries or connection to the national grid).
3. Have students read the article [Photovoltaic roofs](http://link.sciencelearn.org.nz/resources/1745-photovoltaic-roofs) about roofs that are photovoltaic and produce all a household’s electricity requirements.
4. Compare this photovoltaic roofing with photovoltaic panels that are attached to roofs. What is new with this technology? (Using the whole roof to harness energy, using conducting polymers rather than silicon.)
5. Have students write a story about producing or using energy in 50 years time. Where will our energy come from? How will it be supplied to us? What will our transport be like? What sorts of household appliances will we have and how will they be powered?

**Extension ideas**

Students could take apart and examine some solar cells, for example, some old solar garden lights.

Older students could build a solar-powered model car – see <http://hrsbstaff.ednet.ns.ca/jsaunders/Work/TechEd-9/solar%20car%20design%20ideas.pdf>.